

MODIS Aerosol Product

Product Description

The MODIS Aerosol Product (MOD 04) monitors the ambient aerosol optical thickness and size distribution globally over the oceans and the moist parts of the continents. The size distribution is derived only over the oceans; the aerosol type is derived over the continents. Daily Level 2 and daily, 8-day, and monthly Level 3 gridded averages are provided. The Level 2 (MOD 04) data are produced at the spatial resolution of a 10×10 1-km (at nadir) pixel array. The Level 3 (MOD 08) spatial resolution is 0.5° latitude and longitude, equal area and equal angle for both ocean and land, and includes not only aerosol but also cloud and water vapor properties.

Research & Applications

Aerosols are one of the greatest sources of uncertainty in climate modeling. Aerosols modify cloud microphysics by acting as CCN, and as a result impact cloud radiative properties and climate. Aerosol scatters back to space and absorbs solar radiation. The MODIS aerosol product will be used to study aerosol climatology, sources and sinks of specific aerosol types (e.g., sulfates and biomass burning aerosol), interaction of aerosols with clouds, and atmospheric corrections of remotely sensed surface reflectance over the land.

Data Set Evolution

Present satellite measurements are limited to reflectance measurements in one (GOES, METEOSAT) or two (AVHRR) channels. There has been no real attempt to retrieve aerosol content over land on a global scale. Algorithms have been developed for use only over dark vegetation. The blue channel on MODIS, not present on AVHRR, offers the possibility to extend the derivation of optical thickness over land to additional surfaces. The algorithms will use MODIS bands 1 through 7 and 22, and require prior cloud screening using MODIS data. Over the land, the dynamic aerosol models will be derived from ground-based sky measurements and used in the net retrieval process.

Over the ocean, 3 parameters that describe the aerosol loading and size distribution will be

retrieved. Pre-assumptions on the general structure of the size distribution are required in the inversion of MODIS data and the volume size distribution will be described with two log-normal modes: a single mode to describe the accumulation mode particles (radius $< 0.5 \mu\text{m}$) and a single coarse mode to describe dust and/or salt particles (radius $> 1.0 \mu\text{m}$). The aerosol parameters we therefore expect to retrieve are: the ratio between the two modes, the spectral optical thickness, and the mean particle size of the each mode.

The quality control of these products will be based on comparison with ground stations and climatology.

MOD 04, MOD 08 PRODUCT SUMMARY

Coverage:

global over oceans, nearly global over land

Spatial/Temporal Characteristics:

10 km for Level 2; 0.5° latitude and longitude, equal area and equal angle (Level 3)/daily, 8-day, and monthly

Key Science Applications:

aerosol climatology, biomass burning aerosols, atmospheric corrections, cloud radiative properties, climate modeling

Key Geophysical Parameters:

atmospheric aerosol optical depth (global) and aerosol size distribution (oceans)

Processing Level:

2, 3

Product Type:

standard, at-launch

Science Team Contact:

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Suggested Reading

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Kaufman, Y.J. and L.A. Remer, 1994.

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Kaufman, Y.J. and C. Sendra, 1988.

King, M.D., *et al.*, 1992.

Rao, C.R.N., *et al.*, 1989.

Remer, L.A. *et al.*, 1996.

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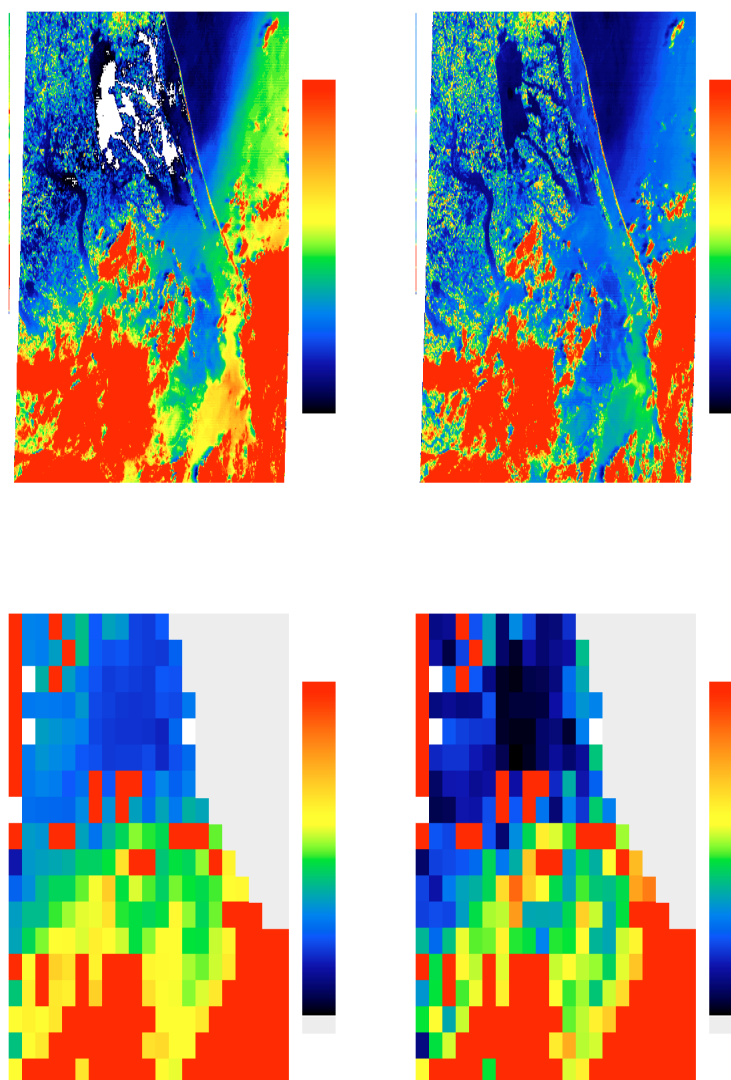


Figure 17. Aerosol Optical Thickness. False color Landsat TM image over the North Carolina -Virginia region (12 July 1993). The apparent reflectance of TM 0.47 μm (left) and 0.66 μm channels (right) are shown in the upper panels. The bottom panels are the corresponding aerosol optical thickness retrieved by the MODIS aerosol algorithm for the reduced resolution Landsat image.